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A DEVICE FOR FORMING TWO-PIECE TELESCOPING CARTONS

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Transportation and Facilities Research Division
Agricultural Marketing Service
UNITED STATES DEPARTMENT OF AGRICULTURE
in cooperation with the
Citrus Experiment Station of the
FLORIDA AGRICULTURAL EXPERIMENT STATION

PREFACE

This report is based on research which is part of a broader project to develop more efficient work methods, equipment, and facilities for the handling and preparation for market of citrus fruits and vegetables at Florida shipping points. Data obtained were used to evaluate the engineering and cost aspects of certain methods and equipment for forming and assembling two-piece telescoping cartons for citrus fruit, and placing them in chutes for delivery to the packing area.

The work was conducted under the supervision of Earl K. Bowman, industrial engineer, and Joseph F. Herrick, Jr., marketing research analyst, of the Handling and Facilities Research Branch, Transportation and Facilities Research Division, Agricultural Marketing Service, U. S. Department of Agriculture. The Agricultural Engineering Department, University of Florida, cooperated by making its shop facilities available for the construction and modification of the metal carton-forming device.

The following Florida citrus packinghouses made their plant facilities available for this study: Alcoma Packing Company, Inc., Lake Wales; Herman J. Heidrich and Sons, Lockhart; Newbern Groves, Tampa; Roper Growers Cooperative, Winter Garden; and Spada Fruit Sales Agency, Inc., Thonotosassa.

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Washington, D. C.

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SUMMARY

Labor requirements for forming and assembling two-piece, full-telescoping fiberboard cartons, used as shipping containers for citrus fruits, can be reduced 35 to 68 percent by use of a metal carton-forming device developed in marketing research by the Agricultural Marketing Service, U. S. Department of Agriculture. The device is designed for forming and assembling cartons of 4/5-bushel size. Performance tests indicated that savings per 100,000 cartons formed in a year will vary from $118 to $466, depending on the present method of forming and assembling cartons.

Equipment for forming cartons, in most packinghouses, consists of either short work tables or wood jigs that are designed to hold the inner piece of the carton during the assembly operation. The USDA carton-forming device is made of 1/2-inch round steel. Rods that are part of the device are shaped to fold the flaps of the outer piece of the carton and to hold the carton during the assembly operation. A metal guide is attached to one side of the device to aid the insertion of the inner piece of the carton into the outer, on a shoehorn principle.

A DEVICE FOR FORMING TWO-PIECE TELESCOPING CARTONS

by William G. Grizzell, industrial engineer
Transportation and Facilities Research Division
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BACKGROUND AND OBJECTIVE OF STUDY

During the last three years, 30 to 33 percent of the shipments of fresh citrus fruit from Florida have been in corrugated cardboard cartons.

These cartons are of the two-piece, telescoping type, consisting of an inner box with four sides, and flaps which form the bottom of the completed carton; and an outer box with four sides, and flaps which form the top of the completed carton.

The packing plant receives the two parts of the carton folded flat, as shown at "A" in figure 3, page 8. The "forming" and assembly operation, discussed in this report, consists of opening the two folded parts into rectangular shape, bending the flaps inward so as to form the top and bottom of the completed container, and slipping the top half of the container over the bottom half (or inserting the bottom half into the top half).

Of the total of 16.6 to 19.7 million two-piece cartons used annually as shipping containers for Florida citrus fruit in the last three years, the majority were of the 4/5-bushel size; 1.6 to 2.8 million were master cartons. 1/ Inside dimensions of the 4/5-bushel carton are 17 x 11 x 9-3/4 inches, and of the master carton, 19 x 13 x 10-1/2 to 11-1/2 inches. 2/

In most Florida packinghouses, container materials traditionally have been stored and boxes formed in the balcony (box balcony) above the main floor. In many packinghouses, handling methods for the 4/5-bushel containers have been patterned after the methods used for wooden boxes. After cartons are made up, they usually are delivered to the packing areas by gravity chutes. However, some packinghouses have begun to deliver containers to the packing area by monorail and belt conveyors.

Time studies were made of carton-forming operations in several Florida packinghouses, and a device was developed to improve the operations. The studies were part of an overall engineering-economic study of citrus packinghouses to develop improved work methods, equipment, and facilities.

Two-piece telescoping cartons are formed in three different ways (fig. 1):

(A) Flaps of inner and outer piece stapled.--The flaps of both the inner and outer pieces are folded in and stapled, and the inner piece of the container is placed inside the inverted outer piece and delivered to the

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1/ All data on volume by type of container were taken from the annual reports of the Citrus and Vegetable Inspection Division, Florida Department of Agriculture.

2/ Box dimensions are from Florida Citrus Commission regulations.

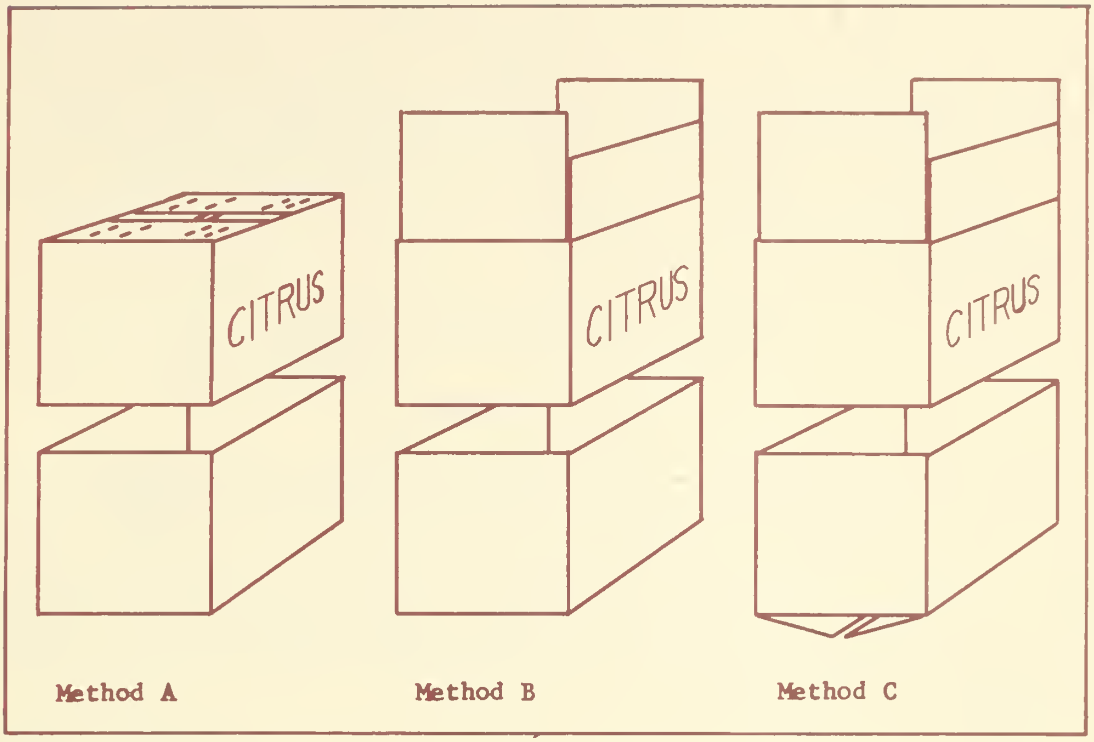

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Figure 1.--Methods of forming two-piece telescoping citrus cartons: A--All flaps stapled; B--flaps of inner piece stapled, outer piece loose; C--all flaps loose.

packing area. The packer sets the outer piece aside, packs the fruit, and forces the outer piece down over the full inner piece, the bulging sides of which often make the operation difficult.

(B) Flaps of inner piece stapled, outer piece loose.--To eliminate the problem of forcing the outer piece down over the inner piece, some of the packinghouses staple only the flaps of the inner piece that form the bottom of the carton. The outer piece is slipped over the inner, its flaps are bent inward to hold the pieces together, and the carton is delivered to the packer. The packer bends the flaps of the outer piece up and out of the way, packs the box, refolds the top flaps, and sets the container on a conveyor line. An automatic glue-seal or stapling machine at the end of the packing line fastens the top flaps of the carton.

(C) Flaps of inner and outer pieces loose.--In the third method, the carton is delivered to the packer assembled, but with loose flaps on both the inner and outer pieces. The packer bends the flaps of the outer piece out of the way and packs the inner part of the container. Full containers are slid onto a conveyor line and delivered to an automatic glue-seal or stapling machine that fastens both the top and bottom flaps of the carton.

The third method of forming cartons, involving no stapling, offered potentials for improvement. In this method, the containers are formed on short work tables or on wood jigs, by either one or two workers. A metal device for forming and assembling cartons was developed, in an effort to reduce costs and to increase the rate of forming and assembling. An engineering-economic comparison was made with present work methods. The carton "forming and assembling" operation includes placing the cartons in gravity chutes or on a monorail conveyor.

FORMING AND ASSEMBLING CARTONS

Wood Carton-Forming Jig

The wood jig is similar to those shown in figure 2. The inner piece of the carton is picked up from a stack of parts, opened, and slipped over the jig with the flaps down. The worker then picks up the outer piece, slips it over the inner piece with the flaps up, and folds the end and side flaps of the outer piece. The assembled carton is removed from the jig and disposed of by one of two methods: It is either (1) tossed aside to a jumbled pile on the floor, or (2) collapsed and set aside on a pile of collapsed two-piece cartons.

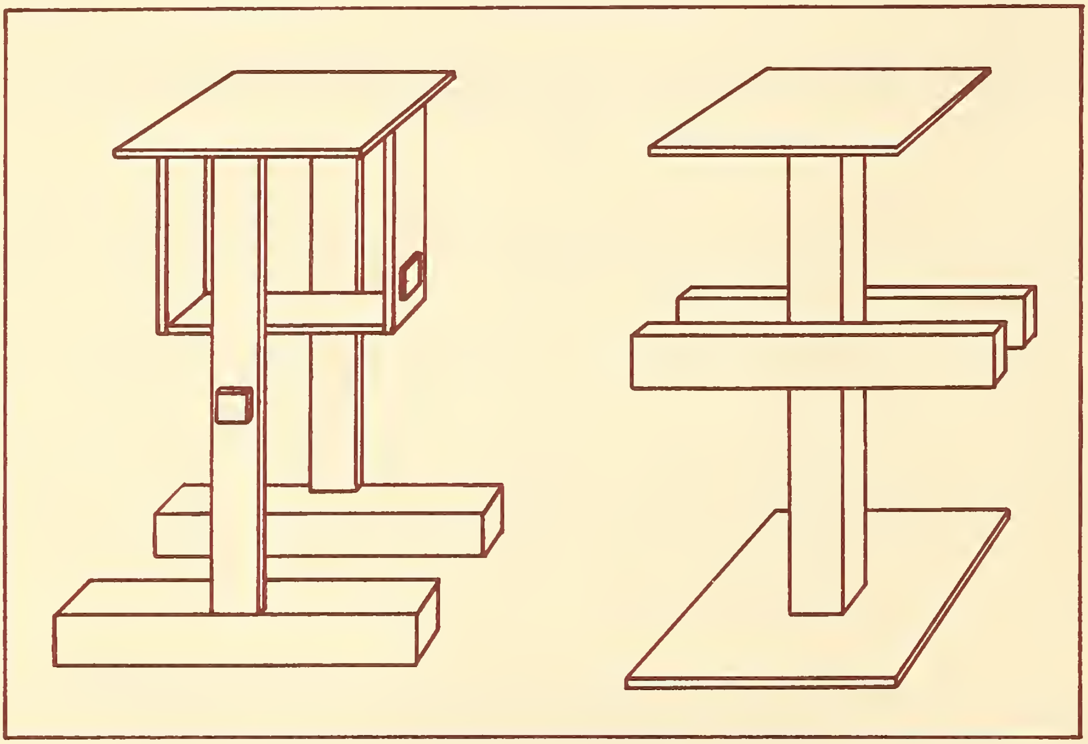

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Figure 2.--Two types of wood jigs used in forming and assembling two-piece telescoping cartons.

Cartons Piled on Floor

One worker formed 315.8 cartons per hour on a wood jig when the formed cartons were tossed aside to a pile on the floor. Another worker was required to pick up cartons from the floor, refold the flaps, and set the cartons in gravity chutes.

Labor requirements and elapsed time for a crew of three workers handling cartons in this manner are shown in table 1. Two of the workers formed cartons on two separate jigs and tossed them onto a pile on the floor. The third worker removed cartons from the pile, refolded the bottom flaps, and set them in a gravity chute.

Table 1.--Labor required for a crew of 3 workers to form and assemble 1,000 two-piece cartons with wood jigs and set the cartons in chutes

Time item	Workers	Labor required
	Number	Man-hours
Productive labor:		
Form and assemble cartons	2	3.16
Pick up cartons from floor and set in gravity chute	1	1.50
Total productive labor		4.66
Unproductive labor:		
Wait for cartons to be formed	1	.08
Total labor	3	4.74
		Hours
Elapsed time		1.58

Cartons Collapsed for Storage

When a worker collapsed cartons after they were assembled (fig. 3), the rate of forming cartons dropped to 284.4 per hour, compared to 315.8 when the cartons were thrown on a pile. Two workers, working together on one wood jig, produced more cartons than one, but at a higher cost per carton. The carton output for two workers on the same jig was 434.8 per hour.

This handling rate, due to layout differences in packinghouses, does not include transportation time required to move collapsed cartons from the forming area to storage. 3/

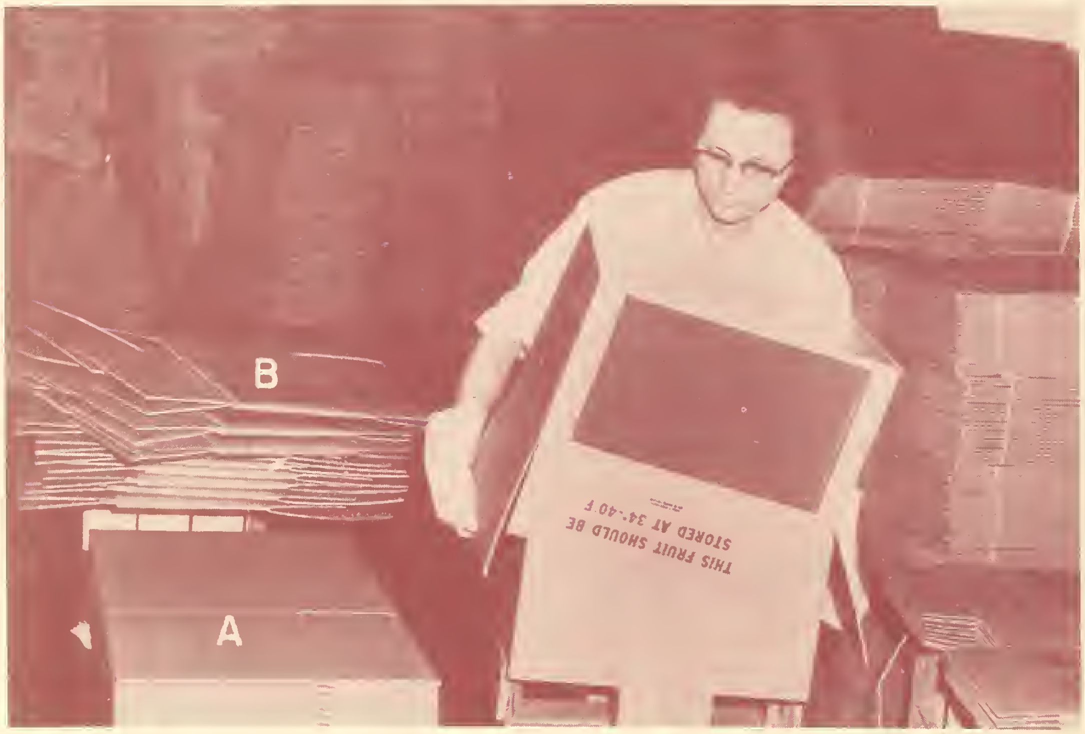

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Figure 3.--Worker assembling cartons with a wood jig. (A) Cartons folded flat as received by the packing plant are at left foreground. (B) Assembled and collapsed cartons are at left rear.

Cartons collapsed after assembly of the two pieces were placed in temporary storage in the box balcony area. These collapsed cartons were removed from storage when needed, transported to a work area, re-formed (fig. 4), and delivered to the packing area by a gravity chute. One worker re-formed and placed cartons in a chute at a rate of 576.9 per hour when the collapsed carton storage was 11 feet from the chute.

3/ Packinghouse managers interested in determining productive time for transporting collapsed cartons in their own packinghouses can use the equation $t = 0.000146d$. This equation is based on the standard walking speed of a worker at 3 miles per hour when t = productive time per round trip in man-hours and d = one-way distance in feet. Labor required for manually carrying collapsed cartons to or from storage can be determined by multiplying the productive time per trip by the number of trips required to move the cartons, based on 15 cartons per trip for women and 25 cartons per trip for men.

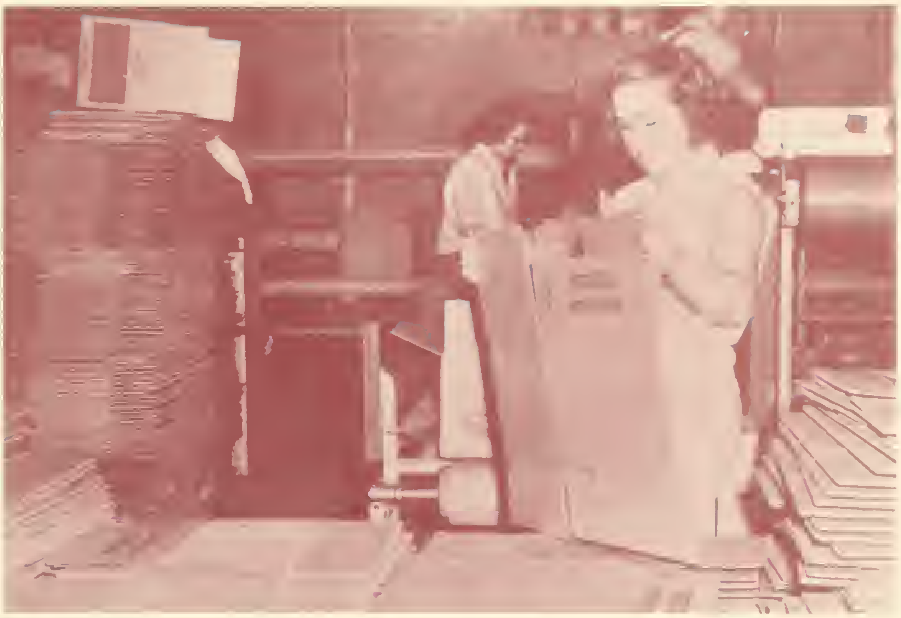

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Figure 4.--Worker re-forming collapsed cartons.

Labor requirements and elapsed time for two- and three-man crews using this method are shown in table 2.

Labor requirements were increased 31 percent when two workers worked together on one jig as compared to one worker working alone.

Wood Table

The wood table for forming cartons is 26 to 27 inches high, with top dimensions 25 by 48 inches. Unformed bundles of parts are set on the table, and cartons are formed on top of them. A bundle of 25 parts adds 7 to 8 inches to the height of the working surface.

When a carton is assembled on the table, the inner piece is picked up, formed, set down on top of unformed parts, and the flaps are folded inward. The outer piece is grasped by the flaps, picked up, and slipped over the inner piece with the flaps down. When the flaps hit the table, the assembled carton is turned over and the inner piece is pushed farther down inside the outer until the two parts are in correct alinement. The worker disposes of the carton by one of four methods: (1) Tossing it aside to a jumble pile on the floor; (2) setting it on a stack of formed boxes seven high; (3) collapsing it and setting it on a pile of assembled two-piece cartons; or (4) setting it in a box chute with the top flaps up. Another worker is required by the first three methods to refold the cartons and set them in gravity chutes.

Table 2.--Labor required by a 2- and 3-man crew to form, assemble, and collapse 1,000 two-piece cartons on a wood jig and to re-form and place them in a gravity chute when they are needed

Time item	2-man crew		3-man crew	
	Workers	Labor required 1/	Workers	Labor required 2/
	Number	Man-hours	Number	Man-hours
Productive labor:				
Form, assemble, and collapse cartons	1	3.52		-
Form inner piece of carton and place on wood jig		-	1	1.22
Form outer piece of carton, assemble, and collapse		-	1	2.30
Re-form cartons from storage and place in chute	1	1.73	1	1.73
Total productive labor		5.25		5.25
Unproductive labor:				
Wait for other worker to complete assembly of carton		-	1	1.08
Total labor	2	5.25	3	6.33
		Hours		Hours
Elapsed time		3.52		2.30

1/ One worker assembled and collapsed cartons for storage. A second worker re-formed cartons from storage and placed them in gravity chutes when they were needed at the packingline, and worked at another activity during slack periods.

2/ Two workers assembled and collapsed cartons on the same jig for storage. A third worker re-formed cartons from storage and placed them in gravity chutes when they were needed at the packingline, and worked at another activity during slack periods.

Cartons Piled on Floor

One worker formed and assembled 333.3 cartons per hour when they were tossed aside to a pile on the floor. Another worker was required to pick up the cartons, refold the flaps, and set them in gravity chutes or on monorail conveyors.

Labor requirements and elapsed time for a crew of 3 workers handling cartons in this manner are shown in table 3. Two of the workers formed cartons on separate tables and tossed them onto a pile on the floor. The third worker removed 666.7 cartons per hour from the pile, refolded the bottom flaps, and set them in a gravity chute. Total labor requirements for the 3 workers per 1,000 cartons were 5 percent less than the 4.74 man-hours required when wood jigs were used and the cartons were piled on the floor.

Table 3.--Labor required for a crew of 3 workers to form and assemble 1,000 two-piece cartons on wood tables and set the cartons in chutes

Time item	Workers	Labor required
	Number	Man-hours
Productive labor:		
Form and assemble cartons	2	3.00
Pick up cartons from floor and set in gravity chute	1	1.50
Total labor	3	4.50
		Hours
Elapsed time		1.50

Cartons Stacked Seven High

The rate of forming cartons dropped from 333.3 per hour for the previous method (in which cartons were tossed to the floor) to 276.5 per hour when the cartons were stacked seven high beside the wood table. A single worker forming and stacking boxes handled 1,000 cartons in 3.62 hours. Additional labor was required to transport the cartons to the chute area, destack, and place them in gravity chutes. Studies were not made to determine the complete labor requirements of this method.

Cartons Collapsed for Storage

Cartons assembled on a table to be collapsed and stored for later use were formed in much the same manner as those that were delivered immediately to the packing area (fig. 5). The inner piece was formed with its flaps up, set on top of the unformed pieces, and one side flap bent inward. The top or outer piece of the carton was picked up by the end flaps, opened, and slipped over the inner piece with the flaps down. When the flaps hit the table, the carton was turned on one side and the inner part of the carton was pushed through the outer piece with the worker's right hand until the folded flap of the inner piece hit the left hand of the worker. The folded flap of the inner piece was straightened by the left hand of the worker, the carton was collapsed, and it was set aside onto a stack of assembled and collapsed cartons. One worker using this method of forming, assembling and collapsing cartons on a table handled 344.8 cartons per hour.

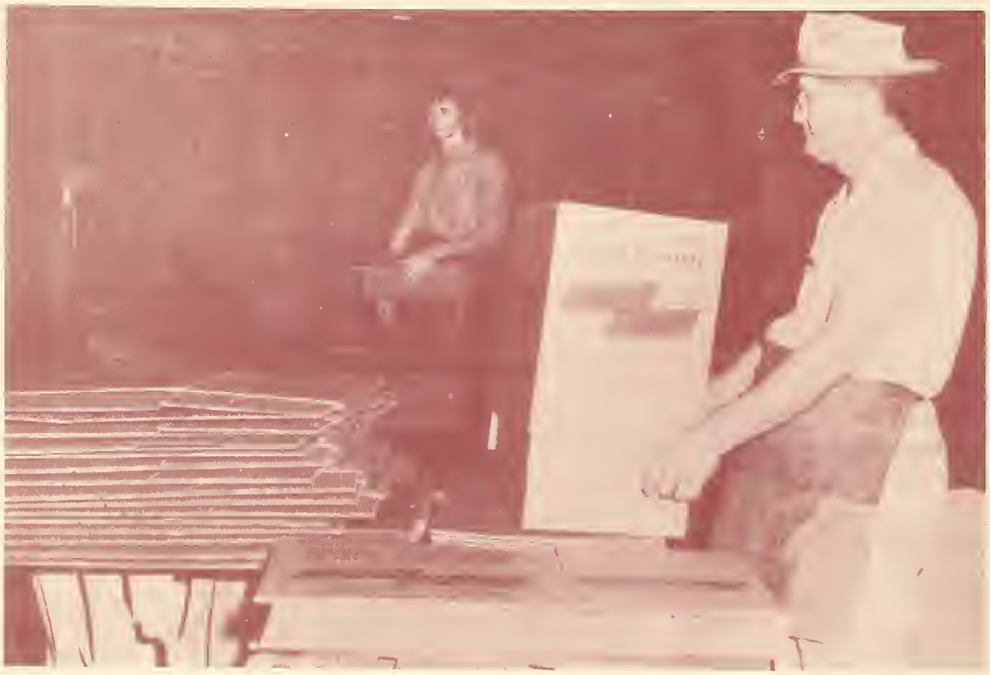

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Figure 5.--Worker assembling and collapsing cartons on a wood table.

Cartons collapsed after assembly of the two pieces were placed in temporary storage in the box balcony area and were handled in the same manner as when they were assembled on wood jigs. One worker re-formed and chuted 576.9 cartons per hour.

The total labor required by this handling method, including re-forming and placing the cartons in the box chute (table 4), was 12 percent less than the 5.25 man-hours required when a wood jig was used.

Cartons Placed Directly in Chute

One-man crew.--One worker forming, assembling, and placing cartons directly in gravity chutes handled 317.5 cartons per hour.

Two-man crew.--When a crew of two workers assembled cartons, one worker formed and held the outer piece while the other worker formed and slipped the inner piece into the outer (fig. 6). In this instance, the first worker turned the outer piece of the carton over before the pieces were assembled and set the assembled carton in the gravity chute.

Table 4.--Labor required for 2 workers to form, assemble, and collapse 1,000 two-piece cartons on a wood table and to re-form and place them in a gravity chute at a later time

Time item	Workers	Labor required 1/
	Number	Man-hours
Productive labor:		
Form, assemble, and collapse cartons	1	2.90
Re-form cartons and place in gravity chutes	1	1.73
Total labor	2	4.63
		Hours
Elapsed time		2.90

1/ One worker assembled and collapsed cartons for storage. A second worker re-formed cartons from storage and placed them in gravity chutes when they were needed at the packingline, and worked at another activity during slack periods.

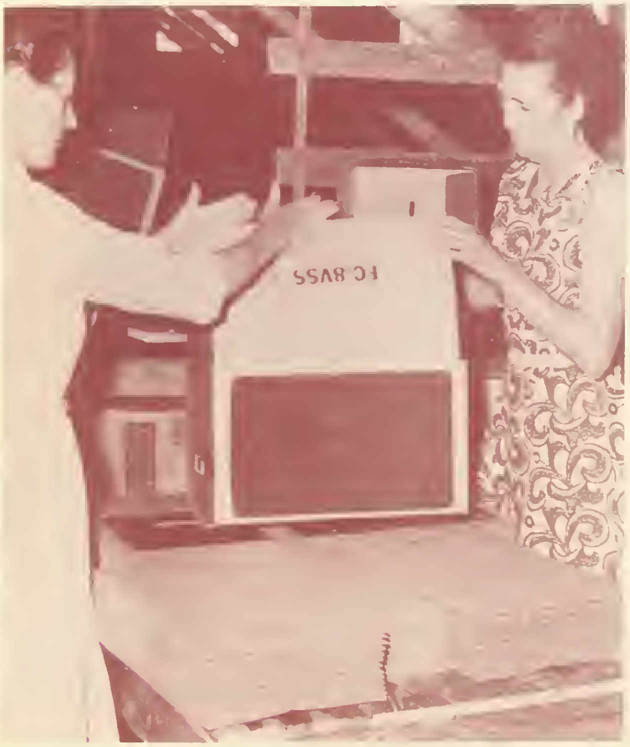

Figure 6.--A crew of two workers assembling a two-piece carton on a wood table.

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A two-man crew, working as a team on one table, formed and placed cartons in chutes at 375.0 cartons per hour. This represented a 70 percent increase in labor required to handle containers, compared to one worker (table 5).

Table 5.--Labor required by a 1- and 2-man crew to form and assemble 1,000 two-piece cartons on a wood table and set the cartons in chutes

Time item	1-man crew		2-man crew	
	Workers	Labor required	Workers	Labor required
	Number	Man-hours	Number	Man-hours
Productive labor:				
Form, assemble, and place carton in gravity chute........	1	3.15		-
Form outer piece, hold for assembly, and place assembled carton in chute................		-	1	2.67
Form inner piece and insert into outer piece of carton.....		-	1	2.00
Total productive labor......		3.15		4.67
Unproductive labor:				
Wait for outer piece of carton to be formed..................		-	1	.67
Total labor................	1	3.15	2	5.34
		Hours		Hours
Elapsed time...............		3.15		2.67

USDA Metal Carton-Forming Device

An improved method of forming cartons was needed for the packinghouses assembling cartons with unfastened flaps. A device for rapid carton-forming was required to keep up with the pace of automatic filling machines, some of which are in use in Florida. It was found that a metal rod fixture to form one-piece cartons had been described in an industrial engineering textbook. 4/ A metal jig had been used in a California citrus packinghouse to form and assemble two-piece telescoping cartons; with it, one worker formed, assembled, and chuted 317 two-piece cartons per hour, besides inserting treated liners. 5/

4/ Barnes, R. M. Motion and Time Study, 3d ed., John Wiley and Sons, 1952.

5/ Rowe, Gordon A. An Improved Method of Forming Cartons. Agr. Ext. Serv., Univ. of Calif. January 1957.

A similar device for forming two-piece cartons was made and tried in a Florida citrus packinghouse. The first model was too slow to maintain the pace of the automatic filling machine, so improved models were made on the basis of a motion picture analysis of the initial trials.

To assemble a carton with the device, the outer piece is picked up, opened, and shoved against the curved section of the device to fold the two end flaps (fig. 7). As the worker moves the carton forward into the device, the two side flaps are folded by two bottom rods. The inner part of the carton is picked up, formed, and inserted into the outer part with the aid of a guide attached to one side of the device. The assembled carton is then shoved directly into the gravity chute for delivery to the packing area. To obtain the maximum carton output, the worker should not step to one side when folding the end flaps of the outer piece with the curved section of the device.

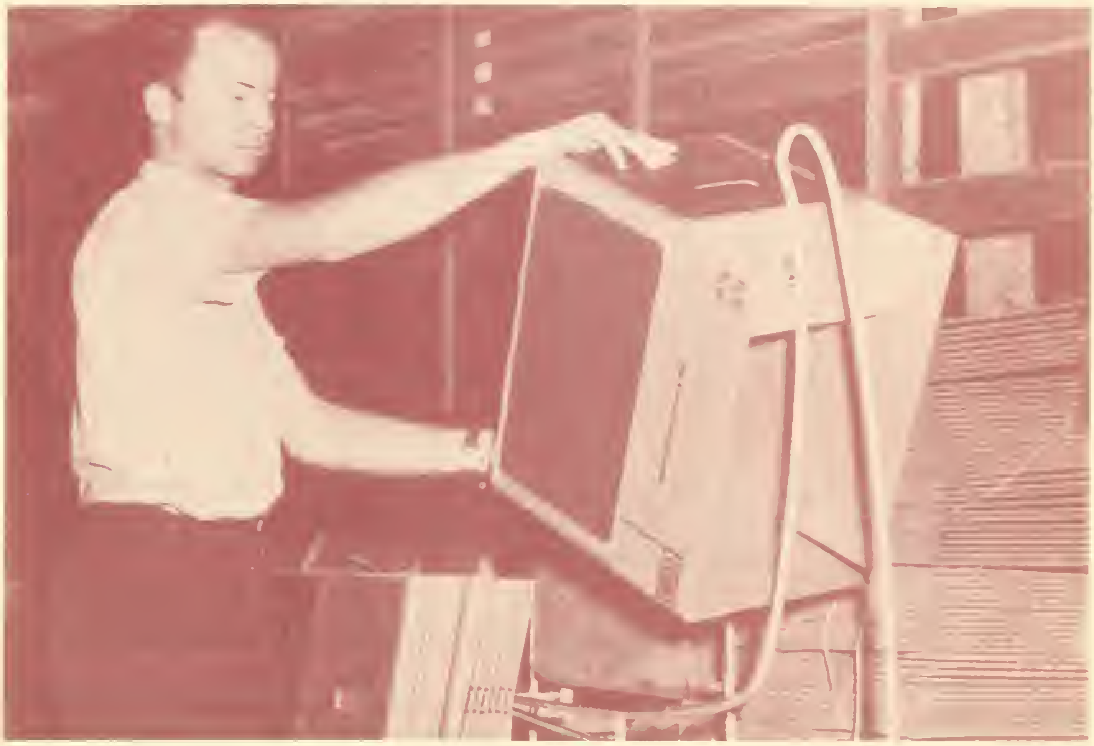

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Figure 7.--Worker forming cartons with USDA device.

The improved carton-forming device enabled one worker to form, assemble, and place cartons in a chute at a rate of 487.7 per hour. The carton output was increased 41 to 72 percent as compared to one worker forming and assembling cartons on either a wood table or wood jig.

Labor requirements were reduced to 2.05 man-hours for 1,000 cartons, a labor reduction of 35 to 68 percent compared to other methods of assembling cartons that were considered (fig. 8). Only two of the handling methods had a greater carton output per hour than the metal device. Both of these methods required a 3-man crew and had a carton output of 144 to 179 per hour more than one worker assembling cartons on a metal fixture. Packinghouses requiring faster output can install two metal fixtures to increase the carton output to nearly 975 per hour, and still save labor as compared to present systems.

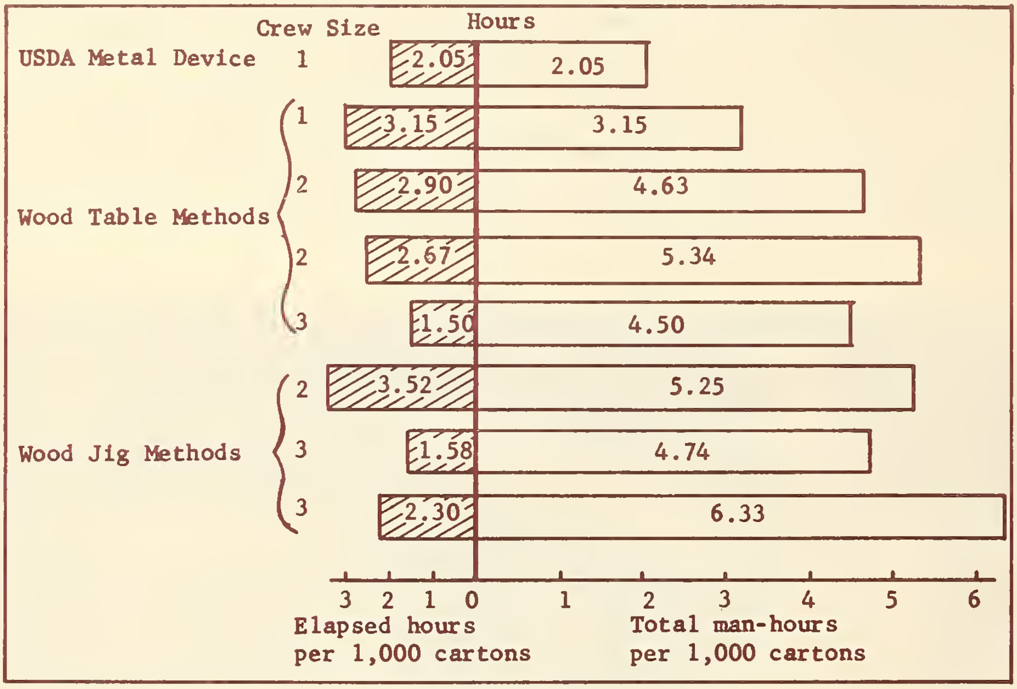

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Figure 8.--Comparative labor requirements to form, assemble, and place in chutes 1,000 two-piece citrus cartons by eight methods for various crew sizes.

COSTS OF CARTON FORMING AND ASSEMBLING OPERATIONS

Nine carton-forming systems and three types of forming and assembling equipment were considered. Labor requirements for eight systems were determined from elemental data and were used to compute labor and equipment costs for the different combinations of methods and equipment (table 6). Equipment costs (table 7) represented only a minor part of the total costs.

Wood Jig

Annual labor and equipment costs were the highest when two workers formed, assembled, and collapsed cartons on one jig and a third worker re-formed cartons and placed them in chutes. When the forming crew was reduced to one worker assembling and collapsing cartons and a second worker re-forming and placing cartons in chutes, the annual savings were $118.80 per 100,000 boxes (table 6).

Table 6.--Labor and equipment costs for forming, assembling, and placing 100,000 two-piece cartons a year in gravity chutes by 8 different methods

Handling method	Crew size	Wood jig			Wood table			USDA device		
		Labor 1/	Equipment 2/	Total	Labor 1/	Equipment 2/	Total	Labor 1/	Equipment 2/	Total
	Number	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Toss cartons on floor	3	521.40	2.70	524.10	495.00	6.46	501.46	-	-	-
Collapse cartons and set aside on pile	3	696.30	1.35	697.65	-	-	-	-	-	-
	2	577.50	1.35	578.85	509.30	3.23	512.53	-	-	-
Place cartons directly in chute	2	-	-	-	587.40	3.23	590.63	-	-	-
	1	-	-	-	346.50	3.23	349.73	225.50	5.94	231.44

1/ Based on a labor cost of $1.10 per hour.
2/ See table 7 for ownership and operating costs.

Table 7.--Annual ownership and operating costs for equipment used in forming two-piece telescoping cartons 1/

Equipment	Equipment cost 2/	Expected life	Annual cost of ownership				Annual cost of operation			Total annual cost	Cost per hour
			Depreciation	Interest 3/	Insurance and taxes 3/	Total	Power	Maintenance	Total		
	Dollars	Years	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Cents
Wood jig	5.00	5	1.00	0.15	0.20	1.35	-	-	-	1.35	0.005
Wood table	12.00	5	2.40	.35	.48	3.23	-	-	-	3.23	.011
USDA device	22.00	5	4.40	.66	.88	5.94	-	-	-	5.94	.020

1/ Based on 300 hours annual use.
2/ Estimate based on cost of materials and $1.50 per hour for labor.
3/ Interest at 5 percent, insurance and taxes at 4 percent of initial investment.

Wood Table

Although a wood table was more expensive than a wood jig (table 7), labor and equipment costs were less for comparable crew methods. A crew of three workers formed and assembled cartons on a table, tossed them onto a pile on the floor, and set them in gravity chutes. When the same crew assembled cartons with a wood jig, tossed them on the floor, and set them in gravity chutes, labor and equipment costs were $22.64 more per 100,000 boxes. When one worker assembled and collapsed cartons and a second worker re-formed and placed the cartons in a chute, the savings were $66.32 per 100,000 cartons a year if they were assembled with a table instead of a wood jig.

The most economical method of making up and handling cartons with a wood table was the one-man crew system of forming, assembling, and placing cartons directly in the gravity chute to the packingline. Annual savings for 100,000 cartons were $151.73 and $162.80, respectively, compared to the three-man crew system of assembling cartons, tossing them on the floor, and setting them in chutes, or the two-man crew system of collapsing cartons for storage and re-forming them at a later time.

USDA Metal Device

The labor and equipment costs to form two-piece cartons with the metal device were less than the costs for the other methods that were studied. Compared to the other systems of making up and handling cartons, the savings were 33.8 to 66.8 percent for 100,000 boxes.

CONSTRUCTION AND INSTALLATION OF USDA METAL CARTON-FORMING DEVICE

The carton-forming device (fig. 9) was made of 1/2-inch round and 1/8 x 1-1/4-inch flat cold finished steel. The carton guide was made of 16-gage steel plate and was attached to the device with three 1/4-inch bolts. The cost of a carton-forming device, including $4.12 for the parts, should be about $22.

Design of Device

The carton-forming device was designed to assemble a carton with exterior dimensions 17-7/8 x 10-7/8 x 10 inches with 5-1/2-inch side flaps and 8-1/2-inch end flaps on the outer piece. The curve of the rod section was shaped to fold the two end flaps of the outer part of the carton and to reduce unnecessary body motions of the worker. The shape of the curve was based on the length of the average worker's arms, dimensions of the carton, and 1/2-inch clearance between the top edge of the carton and the folded part of the carton guide.

The two bottom rods of the device (fig. 10) were shaped to fold the two side flaps of the outer part of the carton. The rods should contact the side flaps 1-1/4 inches from the outer edge of a 5-1/2-inch flap after the worker has moved the carton a few inches into the device. The side flaps should be completely folded when the carton is enclosed within the body of the device.

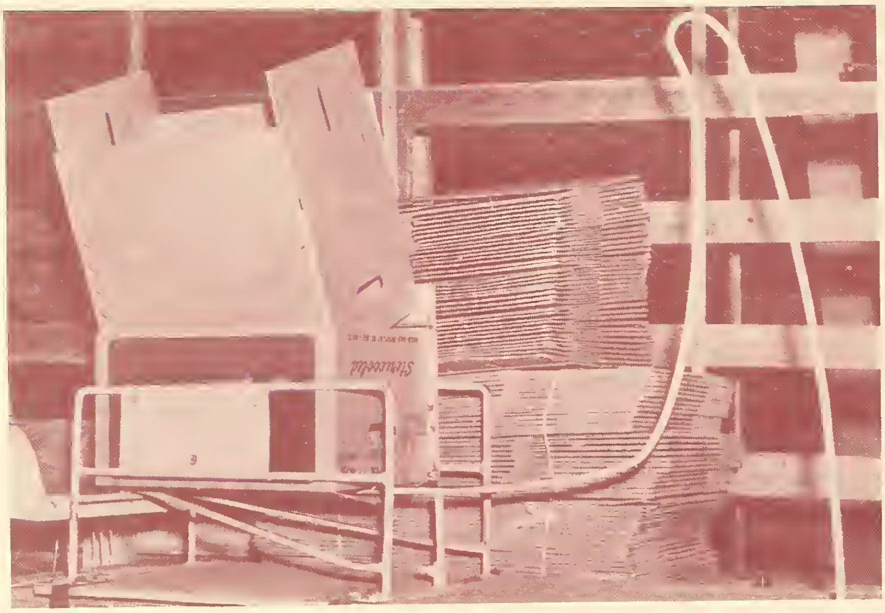

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Figure 9.--USDA carton-forming device.

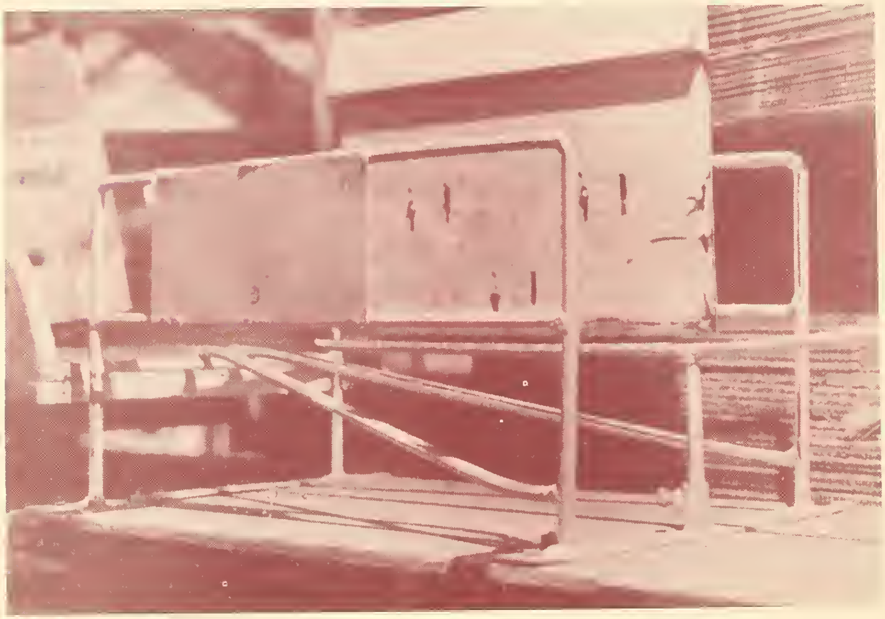

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Figure 10.--A closeup view of the side-flap folding rods and the extension of the end-flap folding rod into the body of the USDA device.

The extension of the end-flap folding rod into the body of the device (fig. 10) should hold the end flaps tightly closed while the side flaps are folding into place. The extension also provides a stable base to support the outer piece of the carton when the inner piece is inserted by the worker.

The carton guide of the device should be adjusted to overlap one edge of the outer piece of the carton when it is released in the device. When properly adjusted, it will guide the inner piece of the carton into the outer piece in the same way that a shoehorn is used to guide the heel of a foot into a shoe.

Workplace Arrangements

The carton-forming device was attached directly to a carton feed chute. Unformed outer pieces were stored vertically between the worker and the device. Unformed inner pieces were stored horizontally on the other side of the device (fig. 11). The flaps of the inner piece should be as close as possible to the device to reduce the reach for the worker to get the piece.

Construction Details

Construction details for the USDA metal carton-forming device are shown in figures 12 and 13.

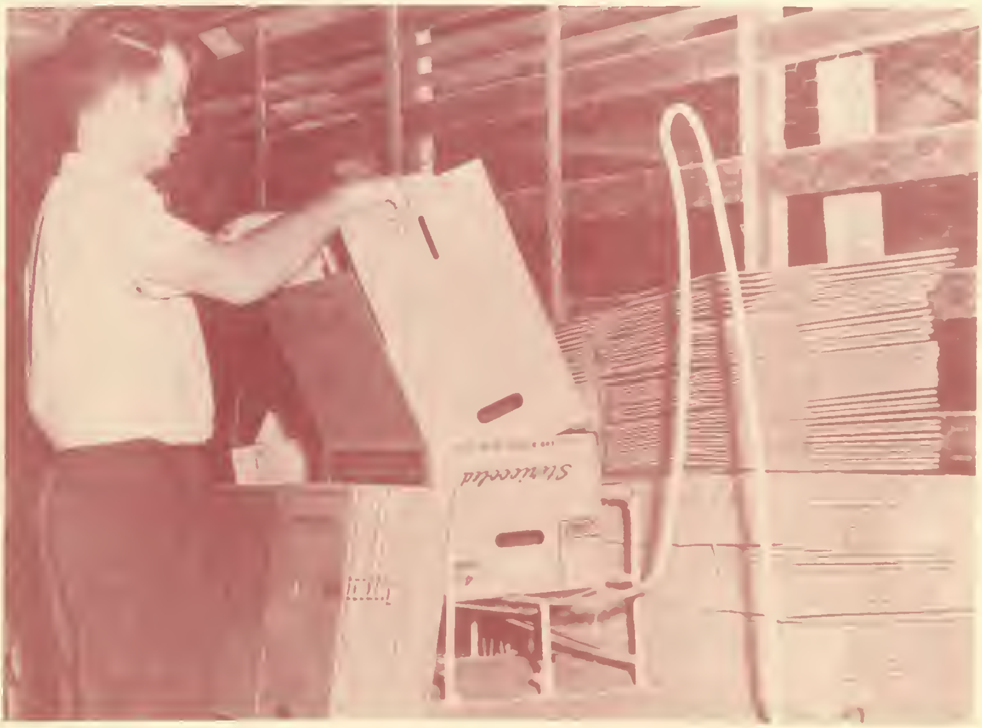

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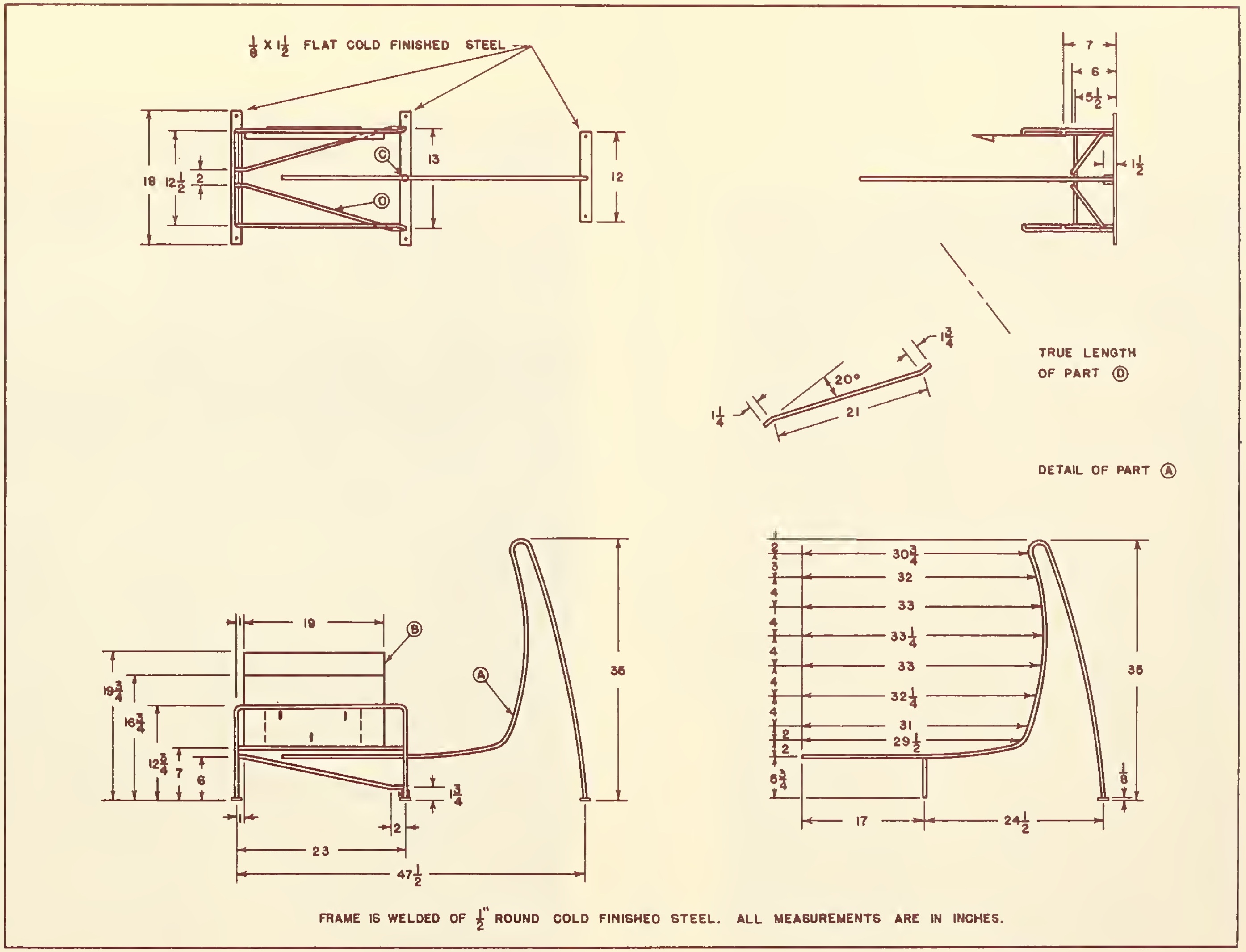
Figure 11.--Worker assembling cartons with USDA device.



FRAME IS WELDED OF $\frac{1}{2}$" ROUND COLD FINISHED STEEL. ALL MEASUREMENTS ARE IN INCHES.

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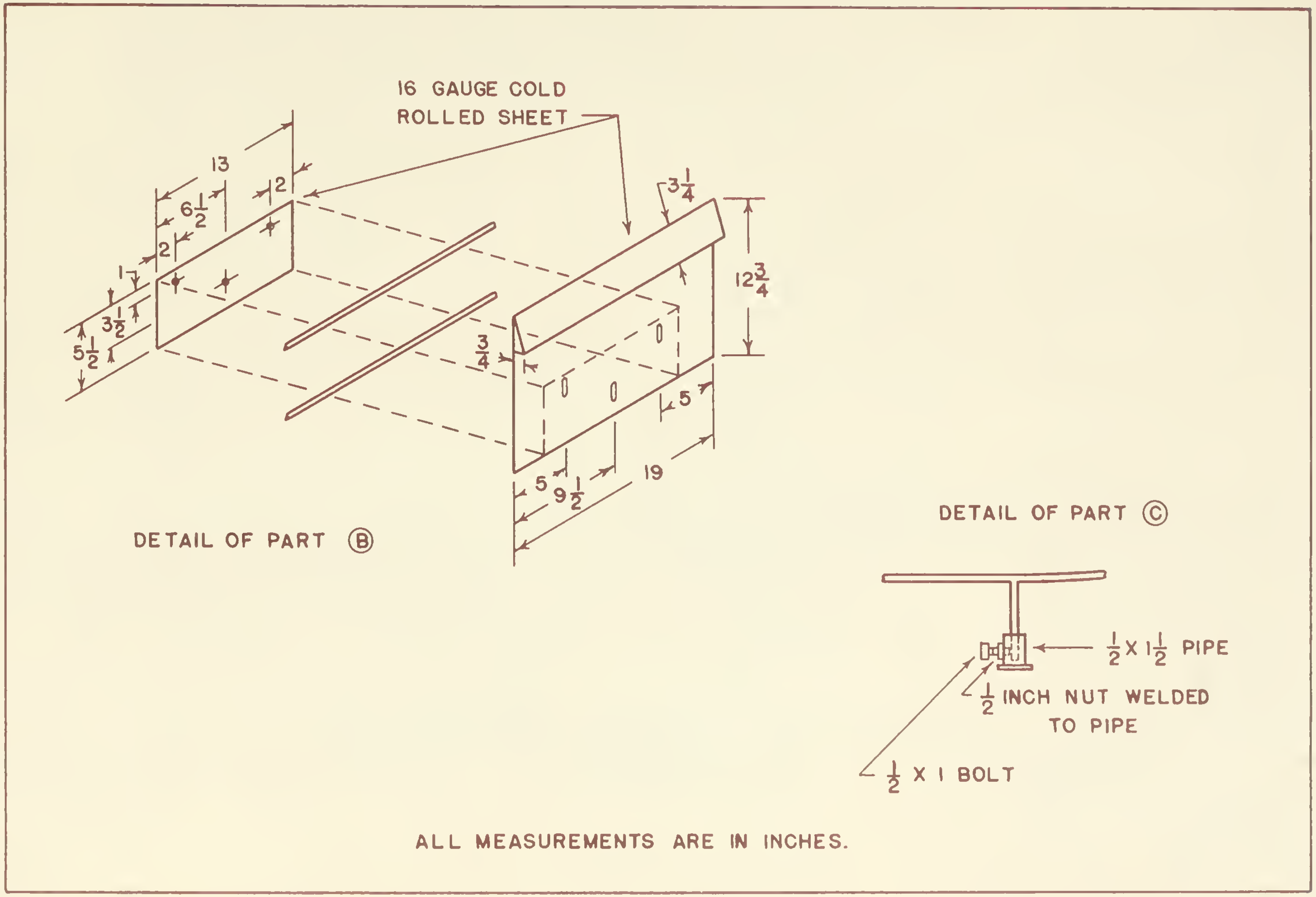
Figure 12.--Construction details for metal carton-forming device.



ALL MEASUREMENTS ARE IN INCHES.

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Figure 13.--Details of specified parts of metal carton-forming device.